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Large Hadron Collider
Magnet Division Specification

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Title: Surface Preparation & Painting Requirements for LHC Vacuum Vessels

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REVISION RECORD

Rev. No.	Date	Page	Subject	Approval
A	5/16/00		Initial Release.	

1. Scope:

This specification describes the surface preparation and painting requirements for the surfaces of the vacuum vessels to be used for LHC magnets built by BNL.

2. Applicable Documents:

N/A

3. Requirements:

3.1 Safety

3.1.1 During abrasive blasting, the following protective equipment, as a minimum, shall be used: Safety Goggles (or Full Face Shield), Facemask, Ear Protection, Safety Shoes and Gloves.

3.1.2 During the application of solvent based coatings adequate ventilation must be maintained in the work area.

3.1.3 All electrical equipment utilized (i.e., blasting, ventilation and coating application) must be properly grounded.

3.1.4 Safety Glasses (or Safety Goggles/Full Face Shield as appropriate) shall be used at all times.

3.2 General

3.2.1 Equivalent products may be acceptable for use in place of those stated in this specification. Prior written approval by BNL is required before substitutions may be made.

3.3 Surface Preparation

NOTE: Blasted surfaces shall be primed within eight hours or before visible rusting occurs. Surfaces which show evidence of rust bloom shall be re-blasted.

3.3.1 Remove dirt, dust, oil, grease, paint, metal chips, chalk or other foreign matter from all exterior and interior surfaces prior to abrasive blasting, other surface preparation, or the application of any coating. Use alkaline, emulsion or solvent cleaners, vapor degreasing, or other suitable means.

CAUTION: Failure to remove oil and grease prior to blasting or other mechanical abrasion techniques will cause these contaminants to be driven into the surface, preventing proper adhesion of the subsequent coatings to be applied.

When necessary, first use detergents, emulsifiers, degreasing agents, steam cleaners and/or biodegradable commercial cleaning agents to remove stubborn deposits. Then follow with the use of hand scrapers, disc sanders, etc. Rinse surfaces thoroughly and allow cleaned item to dry completely.

NOTE: Take necessary precautions to meet local, state and federal safety and environmental regulations when using or disposing of chemical materials.

3.3.2 Dry abrasive blast all unmachined exterior and interior surfaces (except sealing surfaces, which must be protected) to obtain surfaces free of scale, oxide and any other foreign matter. Select angular type abrasive of the proper size, configuration, and hardness to obtain an angular surface profile not exceeding 0.05 mm (2 mils).

Dust resulting from the blast operation must be effectively controlled to prevent spent abrasives and dislodged deposits from impregnating coatings to be applied.

Surfaces must be swept and/or vacuumed thoroughly to remove spent abrasives and dislodged deposits.

3.4 Application of Protective and Decorative Coatings

3.4.1 Prime Coat Application

3.4.1.1 **Caution Notes**

1) Blasted surfaces shall be primed within eight hours or before visible rusting occurs. Surfaces which show evidence of rust bloom shall be re-blasted.

2) Do not apply any coating: a) in humid atmospheric conditions, b) over moist surfaces, c) with air temperature below 45^0F or d) following foggy, rainy or frosty weather.

3) Leak check the vacuum vessel prior to application of the prime coat.

4) Mask all machined surfaces and threaded holes prior to coating.

5) No coating is permitted on interior surfaces of any vacuum vessel.

3.4.1.2 Apply the following prime (first) and intermediate (second) coats to all exterior surfaces specified:

	Prime Coat	Intermediate Coat
Mfr. Designation	*Ferrox 25 Red Primer	*Ferrox 90 Gray
Dry Film Thickness, mm [mils]	0.05-0.08 [2.0-3.0]	0.05-0.08 [2.0-3.0]
Spreading Rate, m^2/l [ft^2/gal]	7.0-10.5 [285 - 425]	7.0-10.5 [285 - 425]

Allow these two coats to dry in accordance with manufacturer's instructions. The prime and intermediate coats must be finish-coated within 30 days and must be kept clean and undamaged.

*NOTE: Coatings so indicated are products of:

Con-Lux Coatings Inc.
Talmadge Road, Box 847
Edison, N.J. USA 08818-0847
(201) 287-4000
(201) 287-9288 (Fax)

3.4.2 Finish Coat Application

After prime and intermediate coatings have dried properly, the exterior of each vacuum vessel is to be painted with the finish coatings specified below:

	Finish Coats
Mfr. Designation ……	†Epolac RAL 5015
Dry Film thickness, mm [mils] …….	0.03 – 0.05 [1.5 – 2.0]
Spreading Rate, m^2/ [ft^2/gal] ……	12 – 17 [500 – 675]
No. of Coats ……..	2 coats

†NOTE: Coatings so indicated are products of:

Asturlak, S.L.
Poligono Bankunion, 23
C/ Agricultura, 32 33280 Tremanes – Gijon – ASTURIAS – SPAIN
Telephone number 34.985.323938
Fax number 34.985.314326

3.4.3 Decal/Logo Application

Note: Allow full dry and cure of painted surfaces prior to subsequent application of decals or logos.

The official Brookhaven National Laboratory logo will be forwarded to the vendor. This logo will be adhesive-backed on transfer paper. Affix the logo in the locations indicated on the referenced magnet assembly drawing.

4. Preparation for Delivery:

Machined surfaces shall be protected from damage using “covers” to be designed and supplied by the Seller. All openings in the vessels shall be closed in such a way that the vessel can be backfilled with dry Nitrogen gas. The pressure shall be approximately 3 millibars [.04 psi] above atmospheric pressure.

The painted surfaces must be adequately protected to prevent damage during shipment.